Supplementary Appendix

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This appendix has been provided by the authors to give readers additional information about the work.

Supplementary Appendix

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Ethical approval

The study was approved by the Hamad Medical Corporation and Weill Cornell Medicine-Qatar Institutional Review Boards with waiver of informed consent.

Competing interests

Dr. Butt has received institutional grant funding from Gilead Sciences unrelated to the work presented in this paper. Otherwise, we declare no competing interests.

Section S1. Databases, methods, and additional results

Study population, databases, and design

The analysis was conducted using the centralized, integrated, and standardized national severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) databases. These databases were retrieved from the nationwide fully integrated digital health information platform and are compiled at Hamad Medical Corporation (HMC),[1] the main public healthcare provider and the nationally designated provider for all Coronavirus Disease 2019 (COVID-19) healthcare needs. Databases are complete and have captured all SARS-CoV-2-related data since the start of the epidemic, including all records of polymerase chain reaction (PCR) testing, antibody testing, COVID-19 hospitalizations, vaccinations, infection severity classification per World Health Organization (WHO) guidelines[2] (performed by trained medical personnel through individual chart reviews), and COVID-19 deaths, also assessed per WHO guidelines,[3] as well as related demographic information. This is because every SARS-CoV-2 PCR test or COVID-19 hospitalization in Qatar is registered into the national healthcare system using the Hamad Medical Corporation Number (national and universal healthcare system number) and Qatar Identification Number.

Each PCR test conducted in Qatar, regardless of location (outpatient clinic, drive-thru, or hospital, etc.), is classified on the basis of symptoms and the reason for testing (clinical symptoms, contact tracing, random testing campaigns (surveys), individual request, healthcare routine testing, pre-travel, and port of entry; Table S1). Qatar has unique demographics by sex and nationality since expatriates from over 150 countries comprise 89% of the population.[4] Databases did not include travel-related data, but most residents of Qatar are working-age adults, and therefore travel is likely to have been of short duration and at considerably lower levels than

pre-pandemic levels, as a consequence of the restrictions and complexities related to travel during the COVID-19 pandemic.

Using the national SARS-CoV-2 databases as a sampling frame, our analysis included all records for SARS-CoV-2 PCR-confirmed infections (a sample size of 353,326 individuals) and related-COVID-19 hospitalizations that are recorded in the national healthcare system between February 28, 2020 (the date when the first SARS-CoV-2 case was recorded) and April 28, 2021 (the closing date of the study). Individuals with a vaccination record between December 16, 2020 (first COVID-19 vaccination in Qatar) and April 28, 2021 were excluded from the analysis. These included 59,937 (68.5%) individuals vaccinated with BNT162b2 (Pfizer-BioNTech) and 27,610 (31.5%) individuals vaccinated with mRNA-1273 (Moderna).

COVID-19 severity, criticality, and fatality classification

Severe COVID-19 disease was defined per WHO classification as a SARS-CoV-2 infected person with "oxygen saturation of <90% on room air, and/or respiratory rate of >30 breaths/minute in adults and children >5 years old (or ≥60 breaths/minute in children <2 months old or ≥50 breaths/minute in children 2–11 months old or ≥40 breaths/minute in children 1–5 years old), and/or signs of severe respiratory distress (accessory muscle use and inability to complete full sentences, and, in children, very severe chest wall indrawing, grunting, central cyanosis, or presence of any other general danger signs)".[2] Detailed WHO criteria for classifying SARS-CoV-2 infection severity can be found in the WHO technical report.[2]

Critical COVID-19 disease was defined per WHO classification as a SARS-CoV-2 infected person with "acute respiratory distress syndrome, sepsis, septic shock, or other conditions that would normally require the provision of life sustaining therapies such as mechanical ventilation

(invasive or non-invasive) or vasopressor therapy".[2] Detailed WHO criteria for classifying SARS-CoV-2 infection criticality can be found in the WHO technical report.[2]

COVID-19 death was defined per WHO classification as "a death resulting from a clinically compatible illness, in a probable or confirmed COVID-19 case, unless there is a clear alternative cause of death that cannot be related to COVID-19 disease (e.g. trauma). There should be no period of complete recovery from COVID-19 between illness and death. A death due to COVID-19 may not be attributed to another disease (e.g. cancer) and should be counted independently of preexisting conditions that are suspected of triggering a severe course of COVID-19". Detailed WHO criteria for classifying COVID-19 death can be found in the WHO technical report.[3]

All primary infections and reinfections in Qatar were treated using the same protocol and standard of care.

Classification of reinfections and infections by variant type

Classification of reinfections and infections by variant type was informed by weekly rounds of viral genome sequencing and multiplex real-time reverse-transcription PCR (RT-qPCR) variant screening of randomly collected clinical samples,[5] as well as by the results of deep sequencing of wastewater samples.[5] All diagnosed reinfections before January 18, 2021, the date of the expansion of the B.1.1.7 wave,[6] were considered as reinfections with "wild-type" variants. Based on existing evidence[7-9] and confirmation with viral genome sequencing,[6] a B.1.1.7 case was defined as an S-gene "target failure" case using the TaqPath COVID-19 Combo Kit platform (Thermo Fisher Scientific, USA[10]; >85% of PCR testing in Qatar) applying the criterion of a PCR cycle threshold (Ct) value ≤30 for both the N and ORF1ab genes, but a negative outcome for the S gene.[9] Meanwhile, with essentially only B.1.351 and B.1.1.7 cases identified from March 8, 2021 up to April 28, 2021 (end of study) in the viral genome sequencing and multiplex

RT-qPCR variant screening,[5] a B.1.351 case was proxied as the complement of the B.1.1.7 criterion, that is any infection with a Ct value ≤30 for the N, ORF1ab, and S genes.[11] Infections after January 18, 2021 with a Ct value ≥30 for the N, ORF1ab, or S genes, or with missing Ct values, were classified as variants of unknown status. However, with the large B.1.351 wave that occurred in 2021, and based on viral genome sequencing and multiplex RT-qPCR variant screening of clinical samples,[5] the majority of these cases are likely to be B.1.351 cases with the remaining being mostly B.1.1.7 cases.

Laboratory methods

Nasopharyngeal and/or oropharyngeal swabs (Huachenyang Technology, China) were collected for PCR testing and placed in Universal Transport Medium (UTM). Aliquots of UTM were: extracted on a QIAsymphony platform (QIAGEN, USA) and tested with RT-qPCR using TaqPath™ COVID-19 Combo Kits (100% sensitivity and specificity[10]; Thermo Fisher Scientific, USA) on an ABI 7500 FAST (ThermoFisher, USA); extracted using a custom protocol[12] on a Hamilton Microlab STAR (Hamilton, USA) and tested using AccuPower SARS-CoV-2 Real-Time RT-PCR Kits (100% sensitivity and specificity[13]; Bioneer, Korea) on an ABI 7500 FAST; or loaded directly into a Roche cobas® 6800 system and assayed with a cobas® SARS-CoV-2 Test (95% sensitivity, 100% specificity[14]; Roche, Switzerland). The first assay targets the viral S, N, and ORF1ab regions. The second targets the viral RdRp and E-gene regions, and the third targets the ORF1ab and E-gene regions.

All tests were conducted at the HMC Central Laboratory or Sidra Medicine Laboratory, following standardized protocols.

Statistical analysis

Descriptive analyses were performed to characterize the study population (Table S1). Odds ratios estimated in this study and their associated 95% confidence intervals (CI) were calculated using the exact method. CIs were however generated using the Cornfield method in cases whenever there were zero events as the exact method could not be applied. Sensitivity analyses were further conducted to estimate the adjusted odds ratios and their associated 95% CIs controlling for age, sex, reason for PCR testing, and variant type in logistic regressions (Table S2). Analyses were conducted in STATA/SE 16.1.[15]

Additional analyses and results

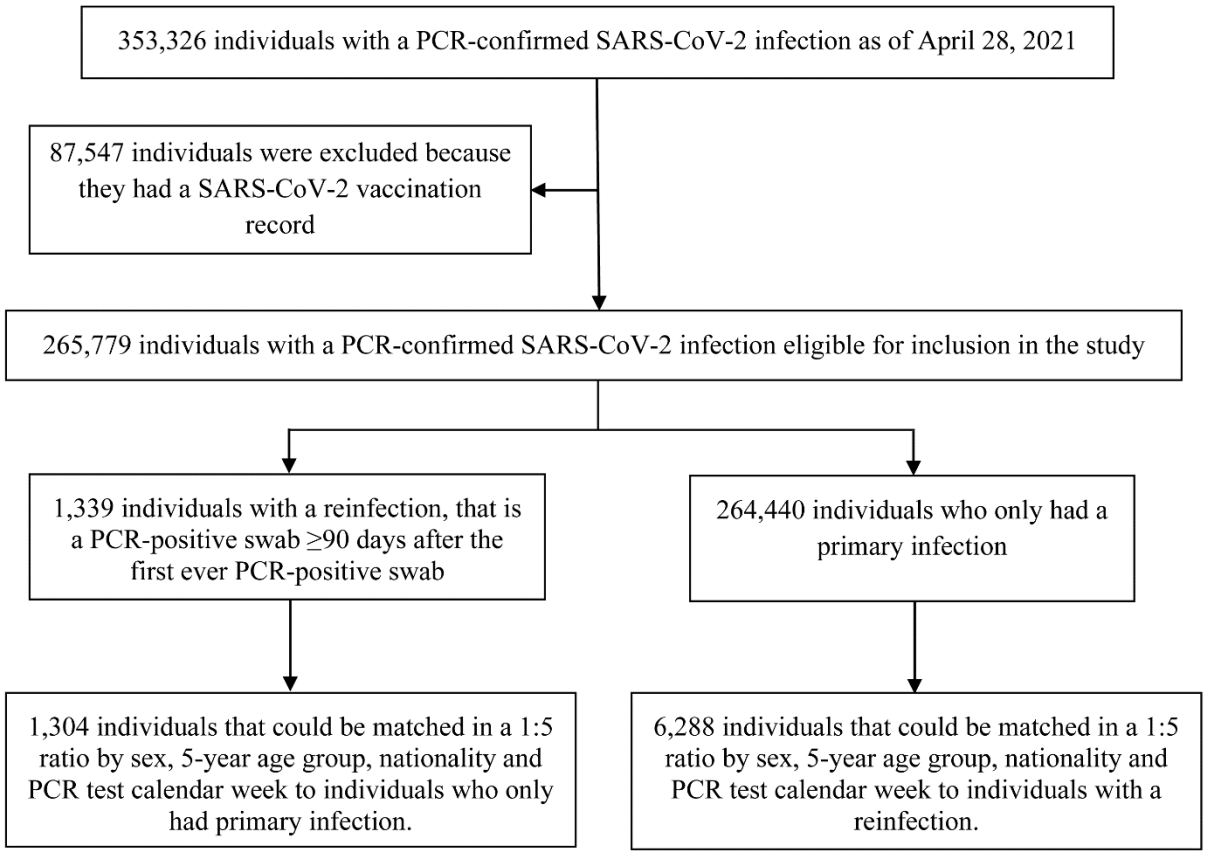
There were significant differences in reason for PCR testing between individuals identified with reinfection and those identified with primary infection ($p<0.001$; Table S1). The results of the sensitivity analysis adjusting for age, sex, and reason of PCR testing in logistic regression confirmed those of the main analysis (Table S2 and Table 1).

There were significant differences in variant type between identified reinfections and primary reinfections ($p<0.001$; Table S1). Of 1,304 reinfections (Figure S1), 413 (31.7%) were B.1.351 cases, 57 (4.4%) were B.1.1.7, 213 (16.3%) were "wild-type", and 621 (47.6%) were of unknown status. Meanwhile, of 6,288 primary infections (Figure S1), 2,364 (37.6%) were B.1.351 cases, 813 (12.9%) were B.1.1.7, 991 (15.8%) were "wild-type", and 2,120 (33.7%) were of unknown status. With the large B.1.351 wave that occurred in 2021, and based on viral genome sequencing and multiplex RT-qPCR variant screening of clinical samples,[5] the majority of cases of unknown status are likely to be B.1.351 cases with the remaining being mostly B.1.1.7 cases. The results of the sensitivity analysis adjusting for age, sex, reason for PCR testing, and variant type in logistic regression confirmed those of the main analysis (Table S2 and Table 1).

Reinfections were rare in Qatar. Out of a total of 353,326 individuals with PCR-confirmed infections between February 28, 2020 (the date when the first SARS-CoV-2 case was recorded) and April 28, 2021 (the closing date of the study), only 1,339 reinfections were recorded, that is a percentage of 0.38% (95% CI: 0.36-0.40%). These results are in line with findings of our earlier SARS-CoV-2 reinfection studies in Qatar where the risk of reinfection and the incidence rate of reinfection were estimated to be low and much lower than those of primary infection.[6,16]

Further background on Qatar's epidemic, such as national seroprevalence surveys,[4,17-19] PCR surveys,[4] and other epidemiological studies can be found in previous publications on this epidemic.[4,11,20-33]

Figure S1. The selection process for identifying the cohort of persons with reinfection and the cohort of persons with primary infection.



Abbreviations: PCR, polymerase chain reaction.
*Individuals with reinfections were matched with up to 5 individuals with primary infection by sex, 5-year age group, nationality, and PCR test calendar week. The final sample size thus includes individuals with reinfections that were matched to 5 or less individuals with primary infection.

Table S1. Demographic characteristics of the cohort of persons with reinfection and the cohort of persons with primary infection.

Characteristics	Persons with reinfection*	Persons with primary infection*	p-value
Median age (IQR) — years	32 (26-39)	32 (26-39)	0.842
Age group — no. (%)			
<20 years	99 (7.6)	462 (7.4)	0.994
20-29 years	391 (30.0)	1,913 (30.4)	
30-39 years	500 (38.3)	2,440 (38.8)	
40-49 years	247 (18.9)	1,194 (19.0)	
50-59 years	56 (4.3)	240 (3.8)	
60-69 years	5 (0.4)	25 (0.4)	
70+ years	6 (0.5)	14 (0.2)	
Sex			
Male	1,130 (86.7)	5,499 (87.5)	0.432
Female	174 (13.3)	789 (12.6)	
Nationality†			
Bangladeshi	154 (11.8)	765 (12.2)	0.534
Egyptian	49 (3.8)	240 (3.8)	
Filipino	70 (5.4)	346 (5.5)	
Indian	379 (29.1)	1,894 (30.1)	
Nepalese	285 (21.9)	1,417 (22.5)	
Pakistani	58 (4.5)	273 (4.3)	
Qatari	113 (8.7)	551 (8.8)	
Sri Lankan	38 (2.9)	183 (2.9)	
Sudanese	30 (2.3)	146 (2.3)	
Other nationalities‡	128 (9.8)	473 (7.5)	
Reason for PCR testing			
Clinical suspicion	342 (26.2)	2,151 (34.2)	<0.001
Contact tracing	133 (10.2)	746 (11.9)	
Survey	321 (24.6)	997 (15.9)	
Port of entry	108 (8.3)	659 (10.5)	
Individual request	133 (10.2)	588 (9.4)	
Healthcare routine testing	211 (16.2)	1,004 (16.0)	
Pre-travel	56 (4.3)	143 (2.3)	
Variant type			
B.1.351	413 (31.7)	2,364 (37.6)	<0.001
B.1.1.7	57 (4.4)	813 (12.9)	
Wild-type	213 (16.3)	991 (15.8)	
Unknown status	621 (47.6)	2,120 (33.7)	

*Reinfections and primary infections were matched in a 1:5 ratio by sex, 5-year age group, nationality, and PCR test calendar week.
†Nationalities were chosen to represent the most populous groups in the population of Qatar.
‡These comprise 58 other nationalities in Qatar.

Table S2. Sensitivity analyses for severity, criticality, and fatality of SARS-CoV-2 reinfections versus primary infections adjusting for A) age, B) age and sex, C) age, sex, and reason for PCR testing, and D) age, sex, reason for PCR testing, and variant type, in logistic regression analyses.

Disease or death outcome[*]	Reinfection[†]	Primary infection[†]	Odds ratio (95% CI)
A) Adjusting for age in logistic regression analysis[‡]			
Severe disease	4	158	0.11 (0.04-0.31)
Non-severe/critical/fatal infection[§]	1,300	6,095	
Critical disease	0	28	Omitted[¶]
Non-severe/critical/fatal infection[§]	1,300	6,095	
COVID-19 death	0	7	Omitted[¶]
Non-severe/critical/fatal infection[§]	1,300	6,095	
Severe, critical, or fatal disease	4	193	0.09 (0.03-0.25)
Non-severe/critical/fatal infection[§]	1,300	6,095	
B) Adjusting for age and sex in logistic regression analysis[‡]			
Severe disease	4	158	0.11 (0.04-0.31)
Non-severe/critical/fatal infection[§]	1,300	6,095	
Critical disease	0	28	Omitted[¶]
Non-severe/critical/fatal infection[§]	1,300	6,095	
COVID-19 death	0	7	Omitted[¶]
Non-severe/critical/fatal infection[§]	1,300	6,095	
Severe, critical, or fatal disease	4	193	0.09 (0.03-0.25)
Non-severe/critical/fatal infection[§]	1,300	6,095	
C) Adjusting for age, sex, and reason for PCR testing in logistic regression analysis[‡]			
Severe disease	4	158	0.13 (0.05-0.36)
Non-severe/critical/fatal infection[§]	1,300	6,095	
Critical disease	0	28	Omitted[¶]
Non-severe/critical/fatal infection[§]	1,300	6,095	
COVID-19 death	0	7	Omitted[¶]
Non-severe/critical/fatal infection[§]	1,300	6,095	
Severe, critical, or fatal disease	4	193	0.10 (0.04-0.29)
Non-severe/critical/fatal infection[§]	1,300	6,095	
D) Adjusting for age, sex, reason for PCR testing, and variant type in logistic regression analysis[‡]			
Severe disease	4	158	0.13 (0.05-0.35)
Non-severe/critical/fatal infection[§]	1,300	6,095	
Critical disease	0	28	Omitted[¶]
Non-severe/critical/fatal infection[§]	1,300	6,095	
COVID-19 death	0	7	Omitted[¶]

Non-severe/critical/fatal infection[§]	1,300	6,095	
Severe, critical, or fatal disease	4	193	0.11 (0.04-0.28)
Non-severe/critical/fatal infection[§]	1,300	6,095	

Abbreviations: PCR, polymerase chain reaction.
[*]Severe disease, critical disease, and COVID-19 death were defined based on the World Health Organization criteria for classifying SARS-CoV-2 infection severity[2] and COVID-19-related death.[3]
[†]Reinfections were matched with up to 5 primary infections by sex, 5-year age group, nationality, and PCR-test calendar week. The final sample size thus includes individuals with reinfections that were matched to 5 or less individuals with primary infection.
[‡]Age was included as a dichotomous variable (<50 years vs. ≥50 years) in the logistic regression analyses.
[§]Infection that did not lead to a severe, critical, or fatal COVID-19 disease.
[¶]Omitted from the model as there were no disease or death cases at reinfection.

Table S3. Characteristics of individuals that progressed to severe, critical, or fatal disease among reinfections and primary infections.

Case number	Age group	Sex	Nationality	Reason for PCR testing	Infection severity*	Co-morbidities and risk factors†
Reinfections						
1	50-54	Female	Qatari	Clinical suspicion	Severe	Diabetes mellitus, Acute kidney injury
2	40-44	Male	Filipino	Clinical suspicion	Severe	Asthma
3	40-44	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
4	45-49	Male	Filipino	Survey	Severe	Hypertension
Primary infections						
5	50-54	Male	Pakistani	Clinical suspicion	Severe	Hypertension, Diabetes mellitus, Leukemia
6	35-39	Male	Qatari	Clinical suspicion	Severe	Obesity
7	70-74	Female	Qatari	Contact tracing	Severe	Diabetes mellitus, Asthma, Neuropathy, Hyperlipidemia, Irritable Bowel Syndrome, Obesity, Osteoporosis
8	55-59	Male	Egyptian	Clinical suspicion	Severe	Hypertension
9	55-59	Male	Bangladeshi	Clinical suspicion	Severe	Hypertension, Hepatitis B virus
10	70-74	Female	Qatari	Clinical suspicion	Severe	Diabetes mellitus, Hypertension
11	45-49	Male	Qatari	Clinical suspicion	Severe	Hypertension
12	40-44	Male	Indian	Clinical suspicion	Severe	Hypertension
13	50-54	Male	Pakistani	Clinical suspicion	Severe	Hypertension, Hypothyroid, Diabetes mellitus, Former smoker
14	35-39	Male	Nepalese	Clinical suspicion	Severe	Not reported
15	35-39	Male	Qatari	Clinical suspicion	Severe	High body mass index
16	45-49	Male	Indian	Individual request	Severe	Diabetes mellitus, Hypertension
17	40-44	Male	Pakistani	Clinical suspicion	Severe	Hypertension, Obesity
18	30-34	Male	Pakistani	Clinical suspicion	Severe	Not reported
19	35-39	Male	Qatari	Clinical suspicion	Severe	Vitamin D deficiency
20	35-39	Male	Qatari	Port of entry	Severe	Not reported
21	40-44	Male	Palestinian	Clinical suspicion	Severe	Not reported
22	40-44	Male	Qatari	Individual request	Severe	Not reported
23	30-34	Male	Bangladeshi	Clinical suspicion	Severe	Diabetes mellitus, Obesity, Hyperlipidemia
24	40-44	Male	Yemeni	Individual request	Severe	Hypothyroidism
25	60-64	Male	Indian	Clinical suspicion	Severe	Hypertension, Obesity, Diabetes mellitus
26	30-34	Male	Indian	Survey	Severe	Diabetes mellitus
27	35-39	Male	Nepalese	Clinical suspicion	Severe	Not reported
28	25-29	Male	Indian	Contact tracing	Severe	Not reported
29	60-64	Male	Bangladeshi	Clinical suspicion	Severe	Diabetes mellitus, Hypertension, Dyslipidemia
30	45-49	Male	Pakistani	Clinical suspicion	Severe	Diabetes mellitus, Iron deficiency anemia
31	45-49	Male	Nepalese	Clinical suspicion	Severe	Obesity

Case number	Age group	Sex	Nationality	Reason for PCR testing	Infection severity*	Co-morbidities and risk factors†
32	45-49	Male	Indian	Clinical suspicion	Severe	Psoriasis on methotrexate, Smoker
33	45-49	Male	Indian	Clinical suspicion	Severe	Not reported
34	50-54	Male	Nepalese	Clinical suspicion	Severe	Diabetes mellitus, Hypertension
35	45-49	Male	Filipino	Healthcare routine testing	Severe	Hypertension, Prediabetes mellitus
36	35-39	Female	Egyptian	Clinical suspicion	Severe	Obesity
37	40-44	Male	Nepalese	Clinical suspicion	Severe	Not reported
38	50-54	Male	Nepalese	Clinical suspicion	Severe	Hypothyroidism, Prediabetes mellitus
39	45-49	Male	Indian	Healthcare routine testing	Severe	Not reported
40	45-49	Male	Indian	Healthcare routine testing	Severe	Not reported
41	40-44	Male	Indian	Healthcare routine testing	Severe	Not reported
42	40-44	Male	Palestinian	Clinical suspicion	Severe	Morbid obesity, Coronary artery disease, Heart attack myocardial infarction, Deep vein thrombosis, Ischemic stroke, Recurrent pulmonary embolism
43	35-39	Male	Nepalese	Clinical suspicion	Severe	Not reported
44	45-49	Male	Egyptian	Healthcare routine testing	Severe	Diabetes mellitus, Hypertension, Chronic kidney disease, Peripheral vascular disease, Obesity
45	45-49	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
46	35-39	Male	Nepalese	Clinical suspicion	Severe	Not reported
47	40-44	Male	Pakistani	Clinical suspicion	Severe	Diabetes mellitus
48	40-44	Male	Egyptian	Clinical suspicion	Severe	Hypertension
49	40-44	Male	Syrian	Individual request	Severe	Diabetes mellitus, Obesity, Smoker
50	45-49	Male	Nepalese	Clinical suspicion	Severe	Not reported
51	40-44	Male	Nepalese	Clinical suspicion	Severe	Hypertension
52	50-54	Male	Jordanian	Clinical suspicion	Severe	Hypertension, Obesity
53	45-49	Male	Sudanese	Clinical suspicion	Severe	Diabetes mellitus
54	55-59	Female	Filipino	Clinical suspicion	Severe	Hypertension
55	35-39	Male	Bangladeshi	Clinical suspicion	Severe	Prediabetes mellitus
56	45-49	Male	Filipino	Healthcare routine testing	Severe	Not reported
57	35-39	Male	Nepalese	Port of entry	Severe	Diabetes mellitus
58	35-39	Male	Qatari	Clinical suspicion	Severe	Not reported
59	40-44	Male	Indian	Clinical suspicion	Severe	Obesity
60	45-49	Male	Nepalese	Clinical suspicion	Severe	Diabetes mellitus
61	50-54	Male	Nepalese	Clinical suspicion	Severe	Not reported
62	20-24	Male	Syrian	Survey	Severe	Obesity
63	40-44	Male	Egyptian	Contact tracing	Severe	Not reported
64	35-39	Male	Indian	Survey	Severe	Not reported
65	35-39	Male	Bangladeshi	Clinical suspicion	Severe	Not reported

Case number	Age group	Sex	Nationality	Reason for PCR testing	Infection severity*	Co-morbidities and risk factors†
66	35-39	Male	Bangladeshi	Clinical suspicion	Severe	Hypertension
67	35-39	Male	Indian	Survey	Severe	Not reported
68	35-39	Male	Nepalese	Healthcare routine testing	Severe	Not reported
69	30-34	Female	Egyptian	Clinical suspicion	Severe	Pregnancy, Obesity
70	35-39	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
71	35-39	Male	Nepalese	Clinical suspicion	Severe	Diabetes mellitus
72	40-44	Male	Indian	Clinical suspicion	Severe	Not reported
73	35-39	Male	Nepalese	Clinical suspicion	Severe	Not reported
74	50-54	Male	Indian	Clinical suspicion	Severe	Asthma, Diabetes mellitus
75	35-39	Male	Nepalese	Clinical suspicion	Severe	Not reported
76	45-49	Male	Indian	Clinical suspicion	Severe	Diabetes mellitus
77	40-44	Male	Indian	Contact tracing	Severe	Not reported
78	50-54	Male	Sri Lankan	Clinical suspicion	Severe	Diabetes mellitus
79	35-39	Male	Nepalese	Healthcare routine testing	Severe	Not reported
80	30-34	Female	Syrian	Clinical suspicion	Severe	Asthma
81	30-34	Male	Filipino	Clinical suspicion	Severe	Not reported
82	50-54	Male	Pakistani	Clinical suspicion	Severe	Not reported
83	45-49	Male	Filipino	Clinical suspicion	Severe	Hypertension
84	40-44	Male	Sri Lankan	Clinical suspicion	Severe	Hypertension, Prediabetes mellitus
85	45-49	Male	Ethiopian	Clinical suspicion	Severe	Hypertension, History of tuberculosis
86	30-39	Male	Indian	Clinical suspicion	Severe	Recent diabetes mellitus
87	55-59	Male	Bangladeshi	Clinical suspicion	Severe	Diabetes mellitus, Hypertension
88	35-39	Male	Indian	Healthcare routine testing	Severe	Hypertension
89	40-44	Male	Nepalese	Clinical suspicion	Severe	Not reported
90	35-39	Male	Bangladeshi	Healthcare routine testing	Severe	Not reported
91	40-44	Male	Tunisian	Healthcare routine testing	Severe	Not reported
92	50-54	Male	Indian	Clinical suspicion	Severe	Diabetes mellitus
93	35-39	Male	Nepalese	Clinical suspicion	Severe	Not reported
94	35-39	Male	Bangladeshi	Healthcare routine testing	Severe	Not reported
95	40-44	Male	Bangladeshi	Clinical suspicion	Severe	Hypertension
96	40-44	Male	Nepalese	Clinical suspicion	Severe	Not reported
97	40-44	Male	Ethiopian	Clinical suspicion	Severe	Obesity
98	35-39	Male	Filipino	Clinical suspicion	Severe	Hypertension, Hypovolaemic hyponatraemia, Cytokine storm, Smoker
99	45-49	Male	Nepalese	Healthcare routine testing	Severe	Not reported
100	35-39	Male	Indian	Clinical suspicion	Severe	Not reported
101	35-39	Male	Indian	Healthcare routine testing	Severe	Not reported

Case number	Age group	Sex	Nationality	Reason for PCR testing	Infection severity*	Co-morbidities and risk factors†
102	40-44	Male	Nepalese	Clinical suspicion	Severe	Diabetes mellitus, Hypokalaemia, Dehydration
103	45-49	Male	Indian	Clinical suspicion	Severe	Diabetes mellitus, Hypertension
104	50-54	Male	Indian	Clinical suspicion	Severe	Not reported
105	40-44	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
106	35-39	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
107	30-34	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
108	50-54	Female	Pakistani	Clinical suspicion	Severe	Hypertension, Hypothyroidism, Prediabetes mellitus
109	40-44	Male	Egyptian	Individual request	Severe	Not reported
110	45-49	Male	Nepalese	Clinical suspicion	Severe	Not reported
111	35-39	Male	Nepalese	Healthcare routine testing	Severe	Prediabetes mellitus
112	35-39	Male	Indian	Contact tracing	Severe	Not reported
113	35-39	Male	Egyptian	Clinical suspicion	Severe	Diabetes mellitus, Obesity
114	35-39	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
115	70-74	Male	Pakistani	Clinical suspicion	Severe	Coronary artery disease, Atrial Fibrillation, Acute kidney injury
116	35-39	Male	Sudanese	Clinical suspicion	Severe	Diabetes mellitus, Hypertension, Obesity, Vitamin D deficiency
117	35-39	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
118	40-44	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
119	35-39	Male	Nepalese	Clinical suspicion	Severe	Not reported
120	25-29	Male	Nepalese	Clinical suspicion	Severe	Not reported
121	25-29	Male	Nepalese	Clinical suspicion	Severe	Prediabetes mellitus, Obesity
122	25-29	Male	Indian	Clinical suspicion	Severe	Diabetes mellitus
123	30-34	Male	Yemeni	Survey	Severe	Smoker
124	20-24	Male	Indian	Clinical suspicion	Severe	Not reported
125	35-39	Male	Pakistani	Clinical suspicion	Severe	High body mass index
126	45-49	Male	Nepalese	Pre-travel	Severe	Not reported
127	40-44	Male	Indian	Contact tracing	Severe	Not reported
128	40-44	Male	Tunisian	Clinical suspicion	Severe	Hypertension
129	30-34	Male	Pakistani	Healthcare routine testing	Severe	Obesity
130	35-39	Male	Indian	Survey	Severe	Obesity
131	35-39	Male	Nepalese	Healthcare routine testing	Severe	Not reported
132	20-24	Male	Bangladeshi	Healthcare routine testing	Severe	Not reported
133	50-54	Male	Indian	Clinical suspicion	Severe	Hypertension, Hypokalaemia, Hyperglycaemia
134	25-29	Male	Nepalese	Healthcare routine testing	Severe	Diabetes mellitus
135	35-39	Male	Indian	Clinical suspicion	Severe	Not reported
136	35-39	Male	Filipino	Clinical suspicion	Severe	Not reported
137	40-44	Male	Bangladeshi	Survey	Severe	Not reported
138	40-44	Male	Bangladeshi	Clinical suspicion	Severe	Not reported

Case number	Age group	Sex	Nationality	Reason for PCR testing	Infection severity*	Co-morbidities and risk factors†
139	40-44	Male	Indian	Clinical suspicion	Severe	Not reported
140	50-54	Male	Indian	Clinical suspicion	Severe	Not reported
141	30-34	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
142	35-39	Male	Filipino	Clinical suspicion	Severe	Not reported
143	35-39	Male	Kenyan	Contact tracing	Severe	Diabetes mellitus
144	40-44	Male	Indian	Healthcare routine testing	Severe	Diabetes mellitus
145	40-44	Male	Bangladeshi	Healthcare routine testing	Severe	Not reported
146	35-39	Male	Indian	Healthcare routine testing	Severe	Not reported
147	40-44	Male	Bangladeshi	Healthcare routine testing	Severe	Not reported
148	45-49	Male	Nepalese	Clinical suspicion	Severe	Not reported
149	30-34	Male	Nepalese	Clinical suspicion	Severe	Not reported
150	35-39	Male	Bangladeshi	Clinical suspicion	Severe	Not reported
151	30-34	Female	Syrian	Clinical suspicion	Severe	Pregnancy
152	45-49	Male	Indian	Clinical suspicion	Severe	Not reported
153	50-54	Male	Indian	Clinical suspicion	Severe	Diabetes mellitus
154	55-59	Male	Indian	Individual request	Severe	Not reported
155	30-34	Male	Nepalese	Clinical suspicion	Severe	Not reported
156	30-34	Male	Nepalese	Clinical suspicion	Severe	Not reported
157	40-44	Male	Bangladeshi	Clinical suspicion	Severe	Obesity
158	25-29	Male	Filipino	Clinical suspicion	Severe	Not reported
159	55-59	Male	Indian	Clinical suspicion	Severe	Not reported
160	40-44	Male	Nepalese	Clinical suspicion	Severe	Diabetes mellitus
161	45-49	Male	Nepalese	Clinical suspicion	Severe	Diabetes mellitus
162	50-54	Male	Indian	Contact tracing	Severe	Not reported
163	40-44	Female	Qatari	Clinical suspicion	Critical	Multiple myeloma
164	50-54	Female	Qatari	Clinical suspicion	Critical	Diabetes mellitus, Hypertension, Gastroesophageal reflux disease
165	25-29	Male	Somali	Clinical suspicion	Critical	Muscular dystrophy, Epilepsy, Seborrheic dermatitis, Xeroderma pigmentosum, Hypernatraemia
166	55-59	Female	Filipino	Clinical suspicion	Critical	Diabetes mellitus, Endometrial cancer stage III
167	70-74	Male	Yemeni	Clinical suspicion	Critical	Coronary artery disease, Diabetes mellitus
168	55-59	Male	Jordanian	Clinical suspicion	Critical	Hypertension
169	50-54	Male	Qatari	Survey	Critical	Hypertension, Beta thalassemia trait, Vitamin D deficiency
170	45-49	Male	Jordanian	Clinical suspicion	Critical	Diabetes mellitus
171	40-44	Male	Syrian	Contact tracing	Critical	Not reported
172	45-49	Male	Filipino	Clinical suspicion	Critical	Not reported
173	40-44	Male	Bangladeshi	Clinical suspicion	Critical	Not reported
174	50-54	Male	Nepalese	Individual request	Critical	Hypertension, Diabetes mellitus

Case number	Age group	Sex	Nationality	Reason for PCR testing	Infection severity*	Co-morbidities and risk factors†
175	40-44	Male	Filipino	Individual request	Critical	Not reported
176	35-39	Male	Filipino	Clinical suspicion	Critical	Acute kidney injury/Chronic kidney disease
177	40-44	Male	Nepalese	Healthcare routine testing	Critical	Diabetic ketoacidosis
178	40-44	Male	Nepalese	Survey	Critical	Not reported
179	40-44	Male	Indian	Clinical suspicion	Critical	Diabetes mellitus
180	45-49	Male	Bangladeshi	Healthcare routine testing	Critical	Pulmonary embolism
181	45-49	Male	Indian	Individual request	Critical	Alcoholic, Liver cirrhosis, Acute kidney injury, Hepatic encephalopathy, Wernicke-korsakoff syndrome
182	45-49	Male	Filipino	Individual request	Critical	Hypertension
183	40-44	Male	Bangladeshi	Clinical suspicion	Critical	Asthma
184	20-24	Male	Pakistani	Survey	Critical	Obesity, Prediabetes mellitus
185	45-49	Male	Sri Lankan	Clinical suspicion	Critical	Not reported
186	35-39	Male	Egyptian	Clinical suspicion	Critical	Not reported
187	35-39	Male	Bangladeshi	Clinical suspicion	Critical	Coronary artery disease, Diabetes mellitus, Peptic ulcer disease
188	55-59	Male	Indian	Clinical suspicion	Critical	Diabetes mellitus, Hypertension
189	40-44	Male	Indian	Contact tracing	Critical	Not reported
190	35-39	Male	Nepalese	Clinical suspicion	Critical	Hypertension
191	45-49	Male	Indian	Clinical suspicion	Fatal	Septic shock, Acute kidney injury, Acute tubular necrosis, Pneumonia
192	40-44	Male	Nepalese	Individual request	Fatal	Septic shock, Multiorgan failure, Acute respiratory distress syndrome, Pneumonia, Obesity, Hypertension
193	45-49	Male	Indian	Clinical suspicion	Fatal	Hyperuricemia, Pulmonary embolism, Septic shock, Acute respiratory distress syndrome, Pneumonia, Acute kidney injury
194	45-49	Male	Indian	Clinical suspicion	Fatal	Myocarditis, Septic shock, Multiorgan failure, Acute respiratory distress syndrome, Pneumonia,
195	25-29	Male	Indian	Healthcare routine testing	Fatal	Cardiogenic Shock, Left ventricular thrombus, Dilated Cardiomyopathy, Myocarditis
196	40-44	Male	Indian	Clinical suspicion	Fatal	Septic shock, Acute respiratory distress syndrome, Pneumonia
197	45-49	Male	Bangladeshi	Clinical suspicion	Fatal	Acute respiratory distress syndrome, Pneumonia

*Severe disease, critical disease, and COVID-19 death were defined based on the World Health Organization criteria for classifying SARS-CoV-2 infection severity[2] and COVID-19-related death.[3]
†These are the co-morbidities and risk factors noted in the comments section of the COVID-19 severity, criticality, and deaths databases based on the individual chart reviews.

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